

KARMENES : The K2+CARMENES low cadence M-dwarf sample for fields 4 and 5

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Low mass stars in the K2 field are relatively faint at optical wavelengths. However, they have stronger fluxes in the nIR. Planets as small as the Earth will cause transits with depths of 0.5-2%. The CARMENES instrument is expected to start operations at the end of 2015. It is a stabilized optical+infrared spectrograph covering from 0.5 to 1.7 microns at $R=82,000$, whose Doppler precision is at 1 m/s level and will use 600 nights of GTO time at the 3.5m Calar Alto telescope between 2015 and 2018). Such precision and amount of telescope time will allow for the systematic detection of Earth-mass planets in the HZ of low mass stars. M dwarfs, even appearing faint at optical wavelengths (e.g. $V, r' \sim 14-18$ mag), have sufficient flux in the optical red and nIR to attain the m/s precision. We kindly request to the K2 team to observe as many late type M stars in fields 4 & 5 as possible. This proposal contains a sample of mid to late M-stars that we could identify. Several planet candidates have been reported in the original Kepler field but they tend to be early type M stars (M0V to M3V, Muirhead et al. 2012 ApJ, Dressing & Charbonneau 2013 ApJ, Martin et al. 2013 A&A). As a result, not much is gained in the red-nIR in terms of flux and follow-up is difficult, if not impossible, with current means such as HARPS-N. Raw pixel-level photometry will be analyzed using the SARS pipeline, and light curves will be searched for planet candidates using Optimal Boxed-Least-Squares (Ofir 2013, A&A). All stars will be analyzed for rotation periods and characteristics of their noise properties (time-scales of correlated noise, flare rates, etc.). Assuming the range of likely densities, Doppler amplitudes will be estimated and targets with enough predicted signal will be followed-up with CARMENES. Confirmation and mass measurements are necessary preliminary steps before attempting spectroscopic characterization with near-future NASA's telescopes (HST and Spitzer but especially JWST). The favorable planet to star radius and mass ratios of the targets in this sample will likely produce the first fully characterizable Earth-like planet in the habitable zone of a star.